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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

CONNELLY CUSHWA, MICHELLE R

ART UNIT	PAPER NUMBER
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2874

DATE MAILED: 11/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/042,798	Applicant(s) LEI ET AL.	
	Examiner Michelle R. Connelly-Cushwa	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 13-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☒ Claim(s) 11 and 12 is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

This application contains claims directed to the following patentably distinct species of the claimed invention:

- I. Claims 1-12, drawn to a tunable etalon apparatus disclosed in Figures 2-15.
- II. Claims 13-20, drawn to a tunable resonator apparatus disclosed in Figures 16-18.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claims are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with Charles Wands on September 17, 2003 a provisional election was made with traverse to prosecute the invention of Species I, claims 1-12. Affirmation of this election must be made by applicant in replying to this Office action. Claims 13-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

Seventeen (17) sheets of formal drawings were filed on January 9, 2002 and have been accepted by the Examiner.

Specification

The abstract of the disclosure is objected to because the abstract contains more than 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

Claims 11 and 12 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only. See MPEP § 608.01(n). Accordingly, the claims have not been further treated on the merits.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-6, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne et al. (EP 1 098 212 A1) in view of McDonald et al. (US 2003/0016707 A1).

Regarding claim 1; In Figures 13-14 and paragraphs [0030] through [0035], Colbourne et al. discloses a tunable etalon apparatus (multi-cavity GT etalon) for receiving input light having input frequency channels therein and for providing output light therefrom, the output light having frequency channels corresponding to the input frequency channels with a relative time delay therebetween (see Figure 14), the tunable etalon apparatus comprising:

- a first variable partial reflector for reflecting and transmitting portions of the input light, the first variable partial reflector comprising:

- a pair of partially reflective surfaces (the surfaces having reflectivities of 1.7% and 30%, see Figure 13), the pair of partially reflective surfaces defining a gap (first cavity, see column 10, lines 17-26) therebetween, the gap (first cavity) comprising a material; and
- control means (heating element) for adjusting the material in the gap, thereby controlling the time delay of the input frequency channels (see column 11, line 54, through column 12, line 12); and
- a back reflector (the back reflector having a reflectivity of 99.8%, see Figure 13), the back reflector for reflecting the transmitted light back to the partial reflector, the back reflector and the first variable partial reflector forming a cavity (GT cavity) therebetween;
- wherein light reflected by the back reflector is partially reflected by and transmitted through the partial reflector, thereby causing interference in the output light.

Colbourne et al. does not specifically state that the material in the gap of the variable partial reflector has a variable index of refraction that is adjusted to control the time delay. However, Colbourne et al. does disclose that the optical path length (d) is adjusted by changing the temperature of the gap or cavity (see column 11, line 54, through column 12, line 12) to control the time delay and that the optical path length is proportional to the index of refraction (n, see column 9, lines 4-14).

McDonald et al. teaches that etalons are tunable to adjust the optical path length by various techniques including thermo-optic tuning to vary the refractive index (see paragraph [0034]), which varies the optical path length, since the optical path length is proportional to the refractive index.

Therefore, thermo-optically tuning the material of the first cavity by providing heating or cooling elements to change the temperature to adjust the optical path length, as taught by Colbourne et al., varies the refractive index of the material, as taught by McDonald et al. Thus, one of ordinary skill in the art would have found it obvious to vary the refractive index of the material in the gap or cavity of the etalon in the invention of Colbourne et al.

Regarding claim 2; the proposed combination of Colbourne et al. and McDonald et al. teaches all of the limitations of claim 2 as applied to claim 1 above, except for specifically stating that the gap between the pair of partially reflective surfaces is filled with electro-optic material. In paragraph [0034], McDonald et al. teaches that various techniques can be used alternatively to vary the refractive index of etalons to adjust the optical path length, the various techniques including thermo-optic tuning, electro-optic tuning, acousto-optic tuning and piezo-optic tuning. And in paragraph [0048], McDonald et al. teaches that an etalon (wavelength selection element) can be tuned electro-optically by applying a voltage when the etalon is comprised of an electro-optic material.

Thus, one of ordinary skill in the art would have found it obvious to adjust the optical path length of the etalon apparatus disclosed by Colbourne et al. with either thermo-optic tuning or electro-optic tuning, since it appears that the device would

function equally well regardless of the specific tuning means employed and McDonald et al. teaches that electro-optic tuning techniques may be used as an alternative to thermo-optic tuning techniques. Therefore, one of ordinary skill in the art would have found it obvious to incorporate an electro-optic material in the gap or cavity of the etalon disclosed by Colbourne et al. in order to tune the etalon electro-optically as taught by McDonald et al.

Regarding claim 4; McDonald et al. teaches that a voltage source is used as a control means to vary the refractive index of the electro-optic material in paragraph [0048].

Regarding claim 5; in Figure 19, Colbourne et al. discloses a tunable etalon apparatus (192, Etalon B), comprising:

- a first variable partial reflector, comprising:
 - o a pair of partially reflective surfaces (Rb_4 and Rb_3 , where $Rb_4=0.04\%$ and $Rb_3=2.3\%$); and
 - o control means (temperature tuning); and
- a back reflector (Rb_1 , where $Rb_1=99.8\%$); and

wherein the apparatus further comprises:

- an additional reflector forming an additional cavity, the additional reflector comprising:
 - o a pair of partially reflective surfaces (Rb_3 and Rb_2 , where $Rb_3=2.3\%$ and $Rb_2=38\%$); and
 - o control means (temperature tuning).

Regarding claim 6; in column 10, lines 19-20, Colbourne et al. teaches that the cavities are made of blocks of silica, thereby forming a solid cavity.

Regarding claim 9; Figure 19 of Colbourne et al. shows a dispersion compensator comprising first and second tunable etalons (191 and 192).

Regarding claim 10; in column 12, lines 40-47, Colbourne et al. teaches that the first and second tunable etalons (191 and 192) may be selected to have substantially equal and opposite dispersion response curves forming an overall dispersion curve that has a flat top bandwidth for each frequency channel.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the proposed combination of Colbourne et al. (EP 1 098 212 A1) and McDonald et al. (US 2003/0016707 A1) in view of Sakata et al. (EP 0 903 615 A2).

Regarding claim 3; the proposed combination of Colbourne et al. and McDonald et al. teaches all of the limitations of claim 3 as applied to claim 2 above, except for the electro-optic material being liquid crystal. In paragraph [0048], McDonald et al. teaches that the electro-optic material may comprise any electro-optic material that is transparent to the light beam. Sakata et al. teaches that liquid crystal droplets dispersed in a light transmissive medium may be used as electro-optic material in an electro-optically tunable etalon (see paragraphs [0004] and [0008] of Sakata et al.).

Therefore, one of ordinary skill in the art would have found it obvious to incorporate liquid crystal droplets dispersed in a light transmissive medium into an electro-optically tunable etalon as the electro-optic material that is transparent to light,

which is taught by McDonald. Thus, one of ordinary skill in the art would have found it obvious to incorporate liquid crystal in the invention of Colbourne et al.

Claims 1, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne et al. (US 2001/0021053 A1) in view of McDonald et al. (US 2003/0016707 A1).

Regarding claim 1; In Figure 8, Colbourne et al. discloses a tunable etalon apparatus (multi-cavity GT etalon) for receiving input light having input frequency channels therein and for providing output light therefrom, the output light having frequency channels corresponding to the input frequency channels with a relative time delay therebetween, the tunable etalon apparatus comprising:

- a first variable partial reflector for reflecting and transmitting portions of the input light, the first variable partial reflector comprising:
 - o a pair of partially reflective surfaces (R_3 and R_2 , the surfaces having reflectivities of 3.6% and 42%, respectively, see Figure 1), the pair of partially reflective surfaces defining a gap therebetween, the gap comprising a material; and
 - o control means (heating element) for adjusting the material in the gap, thereby controlling the time delay of the input frequency channels (see paragraph [0078]); and
- a back reflector (R_1) having a reflectivity of 100% (see Figure 1), the back reflector for reflecting the transmitted light back to the partial

reflector, the back reflector and the first variable partial reflector forming a cavity therebetween;

- wherein light reflected by the back reflector is partially reflected by and transmitted through the partial reflector, thereby causing interference in the output light.

Colbourne et al. does not specifically state that the material in the gap of the variable partial reflector has a variable index of refraction that is adjusted to control the time delay. However, Colbourne et al. does disclose that the optical path length is adjusted by changing the temperature of the gap or cavity (see paragraph [0078]) to control the time delay.

McDonald et al. teaches that etalons are tunable to adjust the optical path length by various techniques including thermo-optic tuning to vary the refractive index (see paragraph [0034]), which varies the optical path length, since the optical path length is proportional to the refractive index.

Therefore, thermo-optically tuning the material of the cavity by providing heating or cooling elements to change the temperature to adjust the optical path length, as taught by Colbourne et al., varies the refractive index of the material of the cavity, as taught by McDonald et al. Thus, one of ordinary skill in the art would have found it obvious to vary the refractive index of the material in the gap or cavity of the etalon in the invention of Colbourne et al.

Regarding claim 7; The apparatus disclosed in Figure 8 of Colbourne et al. further comprises:

- an input means (a fiber) for launching the input light into the apparatus;
- an output means (a fiber) for transferring the output light from the apparatus;
- a collimating means (GRIN lens, 342) for collimating the input light launched by the input means; and
- a focusing means (Grin lens, 342) for focusing the output light onto the output means.

Regarding claim 8; the input and output means include a dual fiber ferrule (dual fiber collimator, 344) encasing an end of an input fiber and an output fiber; and the collimating and focusing means comprise a single graded index (GRIN) lens (342) optically coupled to the dual fiber ferrule in the invention of Colbourne et al.

Conclusion

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (703) 305-5327. The examiner can normally be reached 9:00 AM to 7:00 PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney B. Bovernick can be reached on 703-308-4819. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (703) 308-0956.

Michelle R. Connelly-Cushwa
Michelle R. Connelly-Cushwa
Patent Examiner
October 29, 2003